

L E T T E R

FROM

THE SECRETARY OF STATE,

TRANSMITTING

Information touching expenses of the International Committee of Weights and Measures.

JANUARY 21, 1889.—Referred to the Committee on Appropriations and ordered to be printed.

DEPARTMENT OF STATE,
Washington, January 17, 1889.

SIR: I have the honor to transmit herewith, for the information of the Senate, a copy of the report of Dr. B. A. Gould as American delegate to the session of the International Committee of Weights and Measures, held at Paris in September and October last; also a copy of a dispatch from Mr. McLane, our minister at Paris, inclosing a copy of the special report of the International Committee, estimating the expenditures of the committee for the year 1889 at the usual sum of 100,000 francs, and assessing the United States the sum of 10,111 francs, the same amount as heretofore.

The appropriated amount (\$2,130.33) to meet this Government's share of the deficiency of the first twelve years' period has been paid by the Department to the committee through our minister at Paris. As soon as the International Committee is reorganized, and this Government is notified of the reduced annual assessment to which Dr. Gould's report refers, a corresponding reduction will be made in the annual estimates submitted to Congress, but the appropriation of the full amount called for in the estimates submitted for 1889-'90 will be necessary to enable this Government to discharge its full obligation during the last year of the current duodecennial period.

I am glad to say that experience has fully demonstrated the convenience and utility of the International Bureau of Weights and Measures. It has brought about excellent results in providing universal standards of weight and measure, and incidentally thermometrical standards of universal application.

I have the honor to be, sir, your obedient servant,
T. F. BAYARD.

Hon. JOHN J. INGALLS,
President pro tempore of the Senate.

LIST OF INCLOSURES.

1. Dr. B. A. Gould to Mr. Bayard. November 23, 1888.
2. Mr. McLane to Mr. Bayard. No. 703. November 6, 1888

CAMBRIDGE, MASS., November 23, 1888.

SIR: Having, as American member, attended the session of the International Committee of Weights and Measures at Paris, in September and October last, I have the honor of reporting the general results of the session.

Eleven of the fourteen members were present, the representatives of Russia, Belgium, and England having been prevented from attending, although the session was especially important in view of the arrangements for a general conference next year of the states forming the international metric organization, and for the distribution of the prototypes which have been constructed, prepared, and already in great part verified by the assiduous labor of thirteen years.

Before the lapse of another year the comparison of all the national prototypes of the meter and kilogram will doubtless have been fully completed, leaving to be compared only the few standards of *mètres à bouts*, the bars for which are now in process of construction in the workshops at London, by order of the French Government.

The president and secretary of the international committee were authorized and directed to convene a general conference during the coming year, as soon as all possible doubt shall have passed as to the date at which the comparison of all the standards will be completed and the results calculated. This general conference provided for by the international *convention du metre* of 1875, and consisting of delegates from the contracting powers, will be summoned for the purpose of passing judgment upon the work of the international committee of renewing one-half its membership, of giving it further instructions if thought desirable, and of receiving and transmitting the prototypes ordered by the several States. Present appearances indicate that it may be possible to issue notice in the early spring convening the conference in the month of August or September, 1889.

The international committee will then present to the general conference a full report, as complete as possible, regarding the definite results obtained for the prototypes of weights and measures. But the details of the investigations will be reserved for the volumes of *Travaux et Memoires* of the committee, the seventh of which is now in press, and of which two, or possibly three, more will be requisite for completing the series.

In distributing the prototypes of the meter and kilogram among the several governments which have ordered them, the selection will be made by lot.

Of one hundred and sixty-five series of comparisons of the several prototypes of the meter with the one provisionally selected as apparently best fitted to serve as the permanent international prototype, ninety-five had been completed on the 1st of October last, and there is every reason for believing that the remaining seventy will be finished before the close of April, 1889.

The degree of precision attained in these comparisons is unexpectedly satisfactory, the probable error of a determination of the length of a prototype of the meter not exceeding the ten-thousandth part of a millimeter, and the corrections to be applied to this length in order to bring it into absolute harmony with the international prototype have rarely been found larger than 2 microns, or the five-hundredth part of a millimeter.

Similarly the results obtained for the co-efficients of expansion of the different bars have proved remarkably accurate. These co-efficients have been investigated in various ways, not merely by measurements

of the bars themselves at different constant temperatures, but by examinations by optical methods of pieces of metal taken from the ends of the bars themselves. The values of the co-efficients deduced from the amount of dilatation corresponding to an increase of 1° C. in temperature differ only in the ninth decimal place for the different bars.

Inasmuch as that one of the meter standards which most nearly accords in length with the original "*mètre des archives*" is to be definitely selected for the international prototype, it is already possible to decide which of the thirty that have been prepared will be finally determined upon. It is the one known as No. 7, the length of which at 0° C. appears to be practically identical with the "*mètre des archives*," since the determination of the difference between them gives the thousandth part of a micron, while the probable error of this determination does not exceed seven-hundredths of a micron. Additional computations must, however, be made before accepting this result as definitive.

In the orders given for the national prototypes, a few governments asked for "*mètres à bouts*"—that is to say, for bars which give the length of the meter, as was done in old times, by that of the bar itself, or, in other words, by the distance between the two terminal surfaces, instead of that between delicate lines traced on the principal surface near the extremities. The execution of comparisons between standards of these two classes has offered serious difficulties; but these seem to be now in great measure solved by employing the optical method of Fizeau, as perfected by M. Cornu. Other optical methods are, however, also to be tried. The word prototype is not to be employed for these end-meters, which will be called standards (*étalons*).

To facilitate these determinations, two metallic bars of some other metal than platinum-iridium are to be constructed at once, their extremities presenting two plane surfaces, normal to the axis and polished specularly. Pieces taken from the ends of the bars intended for "*mètres à bouts*" are to be analyzed without delay, to test the purity of the material.

The specular polish, which was adopted last year for the surface on which the graduating lines of the meter-prototypes are traced, has proved very satisfactory, for it permits the attainment of a degree of accuracy which affords an almost un hoped-for equality between the various prototypes, and a perfection in the lines (traces) which allows the application of the most precise and delicate methods.

Notwithstanding all the precautions taken, and the immense pressure to which the material had been subjected, there were a few of the kilogram standards which gave token of appreciable inaccuracy as regarded their density, homogeneity, or constancy of weight under varying conditions. These have been recast and reconstructed with success, and may now be considered as equivalent to the others, having been found satisfactory under the severest tests.

The comparison of all the prototypes for the kilogram is complete, so far as the weighings are concerned; and it is estimated that the calculation of the results will be completed before the end of April.

Sundry embarrassments, arising from an apparent variation of weight manifested by some of the standards, have been removed by the discovery that a considerable longer time than was at first supposed is required for the effect of a washing to pass away. An interval of four weeks has been found to be often requisite for the complete removal of all adhering vapor, and this time is now insisted upon, before comparing any standard which has been subjected to the cleansing process.

The weight of a platinum kilogram which has been kept for a month under circumstances favorable for the removal of all adherent moisture may be regarded as perfectly constant.

A word as to the finances of the international committee may not be inappropriate in this place. At the close of the year 1888 the deficit in their account will be about 70,000 francs, owing to the non-payment of the contributions due by Turkey, Peru, and Venezuela, which three States are in arrears by more than 91,000 francs. A voluntary contribution of 100,000 francs was solicited by the committee from the remaining States, to cover this deficiency and the corresponding one for the current year. All the governments, with a single exception, have manifested cordial good-will and about 28,000 francs had on October first already been received on this account, while the remainder will doubtless be contributed within a short time.

The deficit referred to, which was occasioned by the continuance of the regular current expenses, has been temporarily supplied by employment of sums destined for defraying the expenses of the national prototypes of meters and kilograms, an outlay which the Government of France has provisionally assumed, but which must be re-imbursed during the coming year, and from one for needful repairs of the establishment which have been postponed as long as well possible.

After the distribution of the prototypes, the amount placed at the disposal of the International Bureau will be only 50,000 francs annually; but this distribution can only be considered as complete when the "*mètres à bouts*" have been distributed, and the publication of the documents containing the equations and results of comparison of the prototypes has been accomplished. The Bureau is actively occupied with those publications, which will probably comprise two volumes, though possibly three, in addition to the seven already printed or in press, and may require the years 1889 and 1890.

Under the existing organization the annual expenses are as follows, in round numbers:

	Francs.
Salaries.....	58,000
Publications.....	15,000
Current expenses.....	15,000
Instruments and books.....	5,000
Expenses of Bureau.....	7,000
Total.....	100,000

The work of the committee during its annual session was very active and assiduous, all the operations of the Bureau during the year having been carefully studied and the results minutely scrutinized and the programme of the work during the coming year prescribed in detail. The current business during the interval between the annual sessions is managed by correspondence.

May I request that this report, or a copy thereof, be transmitted through the honorable Secretary of the Treasury to the office of standard weights and measures attached to the United States Coast and Geodetic Survey.

I have the honor to be, etc.,

B. A. GOULD.

Hon. T. F. BAYARD,
Secretary of State.

No. 703.]

LEGATION OF THE UNITED STATES,
Paris, November 6, 1888.

SIR: I have the honor to send herewith a copy and translation of a letter received from the Committee of Weights and Measures transmitting two printed copies of its special report for 1889.

The committee estimates its expenditures at the usual sum of 100,000 francs, and assesses the United States at the same amount as heretofore, viz, at 10,111 francs. It calls attention to the fact that nine States only have paid their share of the extraordinary subvention of 100,000 francs, asked for last year to cover the deficiency left by the failure of certain governments in the payment of their regular quotas; and begs the other states to pay as early as possible, as other deficiencies are to be added to those already noted. Comprising the unpaid quotas of the extraordinary subvention the committee figures, at 69,210.32 francs, the amount actually due to the International Bureau.

Nothing in the report herewith transmitted requiring any special treatment, I send the two copies thereof received from the committee without a translation. As noted in my No. 547, it has not been the practice of this legation to accompany printed documents with a translation, and the personal instructions require only such translation of correspondence, but not of printed matter.

I have, etc.,

ROBERT M. McLANE.

Hon. THOMAS F. BAYARD,
Secretary of State.

[Translation.]

MADRID AND NEUFCHATEL, *November 1, 1888.*

MR. MINISTER: We have the honor to transmit to your excellency for your high Government two copies of the special financial report which we have the habit of sending to the representatives of the States which have signed the Metrical Convention as soon as possible after the adjournment of the session of the International Committee of Weights and Measures in order that, in the various countries, arrangements may be made in time to pay the proportions to be contributed at the beginning of the year, in conformity with the convention.

Please receive, etc.,

GL. IBAUER,
President.
DR. AD. HIRSCH,
Secretary.

[Translation.]

INTERNATIONAL COMMITTEE ON WEIGHTS AND MEASURES.

SPECIAL REPORT TO THE GOVERNMENTS OF THE HIGH CONTRACTING PARTIES.

Budget of the International Bureau of Weights and Measures for the year 1889—
Present financial condition—Enumeration of the payments made by way of extra allowance and refunding of advance—Amounts still to be paid in—Table of quotas.

The International Committee on Weights and Measures has just terminated its regular session, in which, after a most careful previous investigation which was intrusted to a special commission, it has most

thoroughly examined the accounts and the financial condition of the International Bureau.

The high Governments will find the result of this examination stated in detail in the reports of proceedings and in the general report, which will be sent to them next spring. We now perform the duty of giving them a summary statement in this special report of the needs of the International Bureau for the year 1889, and of the present condition of its resources.

A minute inspection of the advancement of the work connected with the prototypes, the reports of the director of the bureau, and of the scientists employed to assist him, and a most careful division of the task which is still to be accomplished, have furnished to the committee ground for the hope that it will be able to convoke, in the course of the coming autumn, the general conference, whose duty it is to approve and distribute the prototypes ordered by the various countries.

Nevertheless, this result, which is so much to be desired, can not be attained unless the committee is enabled to dispose of all the means which, at the outset, were secured to it by the convention. In view of the great efforts that will be required in the course of the coming year, the International Committee on Weights and Measures, in its session of October 9, 1888, unanimously adopted the suggestion of the commission of accounts and finance, which was made in accordance with the request of the director of the bureau, to fix the amount called for by the budget of 1889 at 100,000 francs, by the advice of the same commission it has apportioned this amount among the different branches of the service in the following manner, basing its action in so doing upon the experience of recent years :

Budget for the year 1889.

	Francs
A. Salaries	45,000
B. General running expenses:	
1. Compensation of scientists employed	8,000
2. Keeping in repair of buildings and appurtenances, with furniture	4,000
3. Keeping in repair of machines and fixed apparatus	300
4. Keeping in repair of instruments	400
5. Expenses of "atelier"	800
6. Laboratory expenses	600
7. Purchase of ice and fuel for operations requiring accuracy ..	600
8. Cost of ordinary fuel	2,800
9. Cost of lighting and gas for the machine	3,000
10. Water	300
11. Insurance	360
12. Office expenses	900
13. Library expenses	500
14. Printing and publishing	16,000
15. Expenses of secretary's office	600
	39,160
C. Compensation of the secretary	6,000
D. Sundry and unforeseen expenses, including presents, compensations, and expenses for computers	9,840
Total of annual expenses	100,000

Compared with those of past years this budget presents few points of difference, with the exception of the provision for printing and publishing, which the committee has been obliged to increase, not only because the seventh volume of the Labors and Memoranda is now in press, but also because provision must be made for two other volumes of the same set, in which all the data relative to prototypes are to be published.

As the committee feared would be the case, the financial condition of the International Bureau is less favorable now than it was last year. The arrearages to which the attention of the high governments was called in the last report of the committee have still further increased, owing to the failure of certain governments to pay their quotas for 1888, so that the old arrearages now amount for—

	Francs.
Peru to	4, 174
Turkey to	85, 278
Venezuela to	2, 043
Total	91, 495

The embarrassments of the Bureau have been still further increased by the fact that besides these three states three others are behindhand in the payment of their annual quotas, the entire amount due from them being 4,146 francs, which, together with the amount for which the three others are in arrears, gives at the present time for the annual contribution of 1888 alone an arrearage of 11,932 francs.

Although there is no doubt that the greater part of these 4,146 francs will be paid in before the close of the year, yet it appears from the foregoing figures that the committee did not exaggerate the increase of the arrearages when it requested the contracting states to meet this deficiency by an extra allowance.

This request has, moreover, been generously complied with by the great majority of the governments interested; so far, Great Britain alone has refused. Nine states—Austria, Hungary, Spain, Japan, Roumania, Servia, Sweden, Norway, and Switzerland—have paid in full their quotas of this extra allowance, which altogether amount to 28,697 francs. Italy, for reasons connected with her budget, has paid in 4,458 francs, promising to pay the remainder as soon as the necessary appropriation shall have been secured; this gives, as the total amount of receipts, 33,155 francs.

France, according to a formal declaration, is likewise only waiting before making her payment for the necessary appropriation; it is also for reasons of budgetary formality that the Washington Government has, for the present, suspended its payment; the other states have not yet made known their final decision.

It appears from this brief recapitulation that the International Committee has, thus far, received only about one-third of the extra allowance for which it was obliged to appeal to the generosity of the states in order to make sure of the sum total of the resources which, at the outset, were provided for by the convention for the accomplishment of the task with which it has been charged by the signatory powers.

With this small portion of the extra allowance, the committee has been able to meet the most urgent exigencies of the year 1888; for the year 1889, however, during which the expected completion and distribution of the prototypes will call for sacrifices that must be made, the insufficiency of its resources, to which the committee has called attention in its previous reports, will appear in all its gravity.

This state of affairs again compels the committee to beg those of the high governments that have not yet complied with its request for an extra allowance to be pleased to enable it to meet the necessities of the service.

The committee must call attention to similar delays, even in the repayment of the advances made by it and borne by all the contracting

states which it represents, for the benefit of each state that has ordered prototypes.

Being rendered necessary by the construction of apparatus auxiliary to the prototypes, as was stated in detail in the last special report, these advances were made to seventeen states. Ten only have thus far made payment, the amount thus refunded being 11,160 francs; of the following states, Belgium, Denmark, France, Italy, Portugal, Russia, and Sweden, which have not yet paid, two, France and Italy, have promised to do so as soon as they can secure an appropriation for the purpose, while the five others have as yet made no reply. The International Committee is thus obliged to meet a fresh deficiency of 10,090 francs, and it has instructed us, in the interest of all the states, to request these seven governments to be pleased to issue orders for the repayment of the sums thus advanced.

We conclude this report by giving a table similar to that given in our last special report. It contains in addition to the annual contribution, which is the same as that for 1888, two columns, one of which shows the quotas of the extra allowance for those States which have not yet paid it, and the other the advances which are still to be paid.

Table showing the quotas payable by the contracting States for the support of the International Bureau of Weights and Measures (year 1889).

Contracting States.	Annual expenses 100,000 francs for 1889. (Unit 100 francs 112.)	Extra allowance. (Unit 110 francs 375.)	Repayments of advance made by the committee for prototypes.	Sum total.
1. Germany	13,751	15,011.00	Paid.	28,762.00
2. { aAustria.....	6,067	Paid.	Paid.	6,067.00
{ bHungary.....	4,752	Paid.	Paid.	4,752.00
3. Belgium	1,719	1,876.00	2,540	6,135.00
4. Argentine Republic	607			607.00
5. Denmark	202	221.00	735	1,158.00
6. Spain	7,381	Paid.	Paid.	7,381.00
7. United States of America	10,111	11,038.00	Paid.	21,149.00
8. France	12,841	14,019.00	2,605	29,465.00
9. Great Britain and Ireland	7,078		Paid.	7,078.00
10. Italy	8,595	4,924.32	1,470	14,989.32
11. Japan	3,741	Paid.	Paid.	3,741.00
12. Peru	809			809.00
13. Portugal	1,618	1,766.00	735	4,119.00
14. Roumania	1,517	Paid.		1,517.00
15. Russia	9,403	10,265.00	1,270	20,938.00
16. Servia	506	Paid.	Paid.	506.00
17. { aSweden	910	Paid.	735	1,645.00
{ bNorway	607	Paid.	Paid.	607.00
18. Switzerland	809	Paid.	Paid.	809.00
19. Turkey	6,471			6,471.00
20. Venezuela	506			506.00
Total	100,001	59,190.32	10,090	169,211.32

GENERAL IBENEZ,
President.
DR. AD. HIRSCH,
Secretary.

PARIS, October 20, 1888.